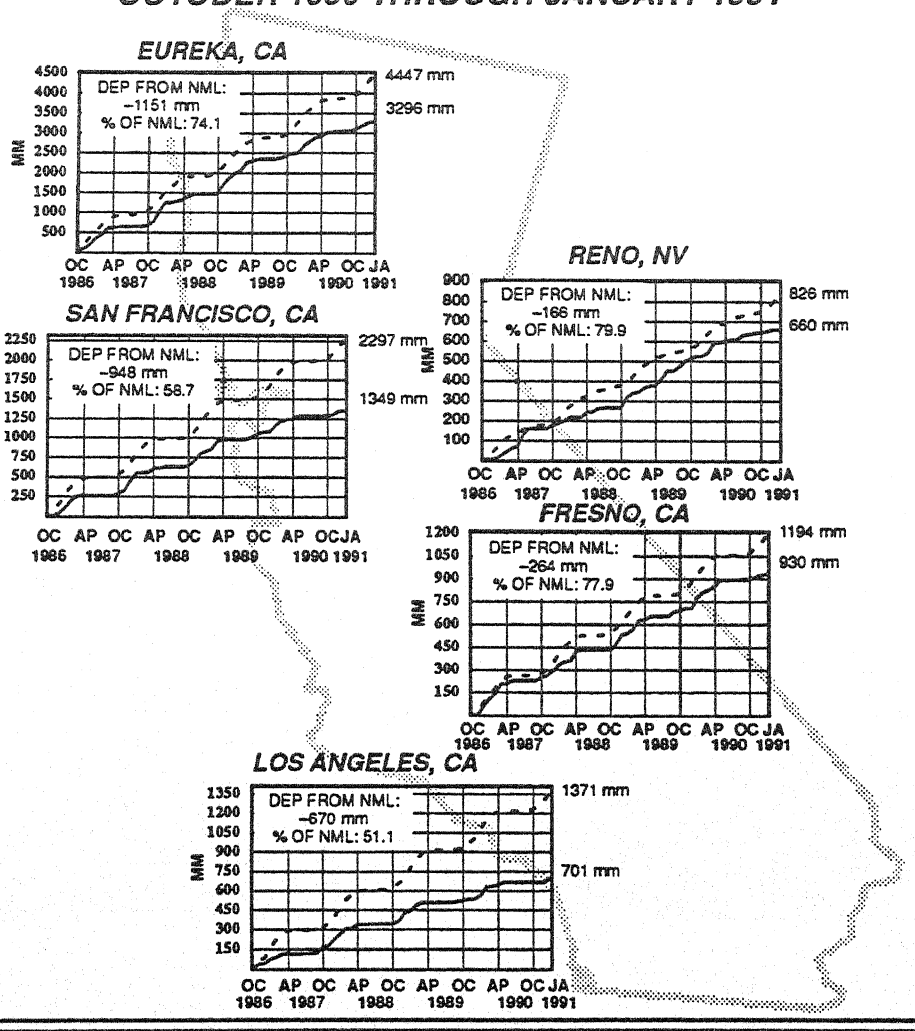
CLIMATE ANALYSIS CENTER

CONTAINS:
UPDATE ON
RECENT
WESTERN
CLIMATE
CONDITIONS

WEEKLY CLIMATE BULLETIN

No. 91/5 Washington, DC February 2, 1991

CUMULATIVE TOTAL PRECIPITATION (Solid Lines) VS. CUMULATIVE NORMAL PRECIPITATION (Dashed Lines) FOR SELECTED LOCATIONS AROUND CALIFORNIA OCTOBER 1986 THROUGH JANUARY 1991



The rainy season in the Far West, which usually runs from late autumn into the early spring months [approximately Oct.–Apr. with the wettest months typically Dec.–Feb.], has yet to become established in southern sections, particularly throughout California. Barring exceptionally heavy precipitation during the next few months, 1990–1991 will become the fifth successive rainy season with subnormal precipitation. Since the start of the 1986–1987 season, large precipitation deficiencies have accumulated, with 51-month deficits surpassing 1000 mm [~40 inches] at locations along the northern coast of California, while less than 60% of the usual precipitation has fallen on central and southern coastal areas.

UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL WEATHER SERVICE–NATIONAL METEOROLOGICAL CENTER

CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *U.S. cooling degree days (summer) or heating degree days (winter).*
- *Global two–week temperature anomalies.*
- *Global four–week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three–month precipitation anomalies (once a month).*
- *Global twelve–month precipitation anomalies (every three months).*
- *Global three–month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF FEBRUARY 2, 1991

tern North America:

FIFTH CONSECUTIVE DRY WINTER UNDERWAY.

rkable long-term precipitation deficits have developed ;hout California during the past $4^1/_2$ years. Most coastal ıns have received only 50%-60% of normal precipitation and ulated departures as large as 1150 mm during the period [see Cover and Special Climate Summary for more information on erm precipitation shortfalls]. Ample precipitation fell across rn California (20-35 mm) and western sections of the Pacific west and British Columbia (30-100 mm), providing some from extreme short-term dryness that had plagued those areas late December. Little or no precipitation, however, fell across l California as moisture deficits increased. Most locations in l and northern California have measured only 12-40% of l precipitation since late December, with San Francisco, CA ing its driest January on record (only 6 mm). Shortfalls of 5 mm have accumulated since late December [5 weeks].

tern Canada:

ARCTIC AIR REMAINS ENTRENCHED.

eratures averaged 3°C to 10°C below normal as bitterly cold er spread northward. Readings as low as -41°C and wind down to -71°C were observed [5 weeks].

theastern United States:

HEAVY RAINS AGAIN INUNDATE MANY AREAS.

weather brought some relief to the west-central Gulf and Atlantic coasts, but moderate to heavy rainfall (35-100 through the remaining areas caused surpluses to increase at locations. Extremely heavy rains (125-220 mm) inundated of the region along the central and east-central Gulf Coast cross southern Georgia, where strong wind gusts, hail, and a ornadoes affected several areas. Since mid-December, huge l surpluses of 305-485 mm have been measured along the l and east-central Gulf Coast, while 100-240 mm above l precipitation has fallen long the west-central Gulf and rn Atlantic coasts [10 weeks].

'ern South America:

AMPLE RAINS REDUCE AREAL EXTENT OF DRYNESS.

ous rains (40-95 mm) eliminated moisture deficits across n Uruguay, southern Brazil, and southeastern Paraguay. ll totals, however, were much smaller across eastern Uruguay orthern Paraguay (5-20 mm), allowing large moisture deficits 15 mm since mid-December) to persist in those areas [Ending weeks].

5. Central and Southeastern Europe:

DRYNESS DEVELOPS ACROSS MUCH OF EUROPE AS COLD AIR INVADES REGION.

Another week of moderate rains (20-50 mm) relieved short-term dryness across the northern Middle East, southern Greece, and southern Turkey while 35-100 mm of precipitation abruptly halted the dry spell along the southern and eastern coasts of the Black Sea. In contrast, very dry weather prevailed throughout most of Europe, with only 10-25 mm measured in the Balkans and little or none elsewhere. Many locations reported 50-100 mm less than normal precipitation since late December [Dry - 7 weeks]. Cold air has accompanied the recent dryness, particularly through the Balkans and Eastern Europe, where temperatures have averaged 4°C to 10°C below normal during the past couple of weeks [Cold - 2 weeks].

6. Southern Africa:

EXCEPTIONALLY WET WEATHER CONTINUES AFTER SLOW START TO RAINY SEASON.

Heavy rains again soaked much of northern Zambia (80-150 mm) and spread southward through eastern Cape of Good Hope and western portions of Orange Free State and Transvaal (50-100 mm; data was not available from Botswana). Since mid-December, surpluses of 130-265 mm have accumulated across northern Zimbabwe, and scattered departures of 75-135 mm were observed in central South Africa [5 weeks]

7. The Philippines and northern Borneo:

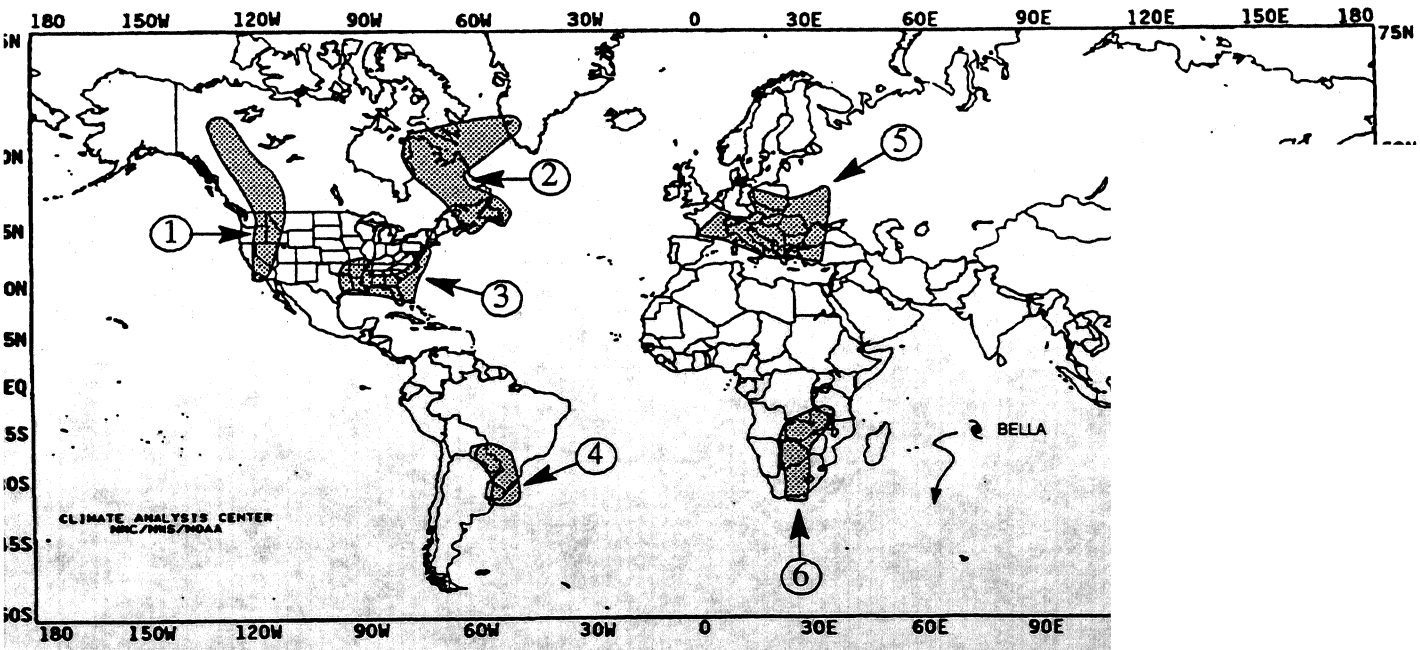
COPIOUS RAINS SOAK NORTHERN BORNEO, BUT THE PHILIPPINES REMAIN VERY DRY.

Very heavy rains of 150-200 mm fell across northern Borneo, bringing a sudden end to the recent dry spell [Ended after 7 weeks]. Across the Philippines, scattered locations in southeastern Luzon measured 50-100 mm while several locations along the eastern fringe of the country reported 20-55 mm. Elsewhere, little or no precipitation fell as six-week moisture deficits increased across most of the nation [9 weeks].

8. Northeastern Australia:

DELUGING RAINFALL CONTINUES.

Weekly totals of 100-325 mm were measured across central and northern coastal Queensland and across the northern Cape York Peninsula. Daily totals exceeded 235 mm along the central Queensland coast, which were previously inundated by Cyclone Joy and its residual moisture. These locations have amassed 1195-1270 mm of excess rainfall since mid-December, while most other coastal locations accumulated 185-755 mm above normal precipitation during the period. Lesser departures were measured farther inland, but most locations have observed between 2 and 4.5 times normal rainfall during the period [6 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature depart

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this temperature anomalies, four week precipitation anomalies, long-term anomalies, and other detail

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF JANUARY 27 – FEBRUARY 2, 1991

The final days of January and the first few days of February produced vide variety of weather across the nation. Blizzard–like conditions ught nearly a foot of snow and 50 mph wind gusts to northern portions the Rockies and Plains while wind chills less than –30°F affected the rthern half of the High Plains. Farther east, lake–effect squalls dumped r a foot of snow on parts of the snow–belt areas in Ohio and New York. uthwestern sections of the latter state experienced white–out nditions as strong winds kicked up snow, producing near–zero ibilities. Farther south, strong thunderstorms raked parts of the utheast and central Gulf Coast, generating heavy rains and spawning nadoes in Louisiana, Georgia, and northern Florida. Several inches of n once again inundated much of the Deep South, causing flash flooding m the Carolinas to Louisiana. Some locations reported up to 16 days of asurable rain during January, with monthly totals in excess of 20 hes. Colder surface air on the western fringes of the precipitation sed freezing rain across central Texas, glazing numerous roads and ating dangerous travel conditions. In Alaska, more winter–like nditions over–spread the state after unusually mild weather a week lier. Strong winds produced wind chills below –70°F at Bethel and up foot of snow blanketed southeastern Alaska before a change–over to vy rain that caused localized flooding. Nearly 8 inches of water ered packed ice in some areas near Juneau, and avalanche warnings re issued where the rain made the snow pack unstable. In sharp trast, southern Florida basked in unseasonably warm weather as highs red into the eighties. Miami tied or established four new daily record hs during the week. By week's end, a warming trend took place from central Plains to the upper Great Lakes, producing numerous record ximums. International Falls, MN soared from a low of 18°F up to 55°F Saturday, establishing a new record high for the month of February pite 18 inches of snow cover.

The week began with a strong cold front pushing rapidly theastward across the northern tier of states. Heavy snow and high ds accompanied the leading edge of the colder air across the northern central Rockies, with parts of Wyoming receiving as much as a foot of w. Winds gusted in excess of 50 mph at some locations, producing d chills down to –45°F and dropping visibilities to near zero. As the t tracked eastward toward the Appalachians, the cold air collided h moisture from a storm system along the central Gulf Coast, ducing a wintry mixture of precipitation across the southern Plains and dwest. To the south, severe thunderstorms pounded parts of the Deep th, dumping several inches of rain from Louisiana to northern Florida. storm spawned a tornado in Kenner, LA which caused extensive nage. Farther north, more winter–like temperatures returned to ska, replacing extraordinarily mild conditions that pushed the rcury to a record high 45°F at Valdez on Sunday. Heavy snow nketed the Tanana Valley, with up to 10 inches reported near rbanks.

During the latter half of the week, the system along the central Gulf st pushed into the Southeast, spawning more severe thunderstorms pounded parts of Georgia and northern Florida. Up to 6 inches of rain ndated parts of the Macon, GA area during a 30–hour period, and over inches fell at Valdosta and Pensacola, FL. Tornadoes accompanied e thunderstorms across Georgia and Florida. The first twister touched vn at Shingler, GA and the second, which began as a water spout, ved onshore near Panama City, FL. Farther north, a secondary area of low pressure developed along the cold front over the Appalachians, spreading a variety of precipitation across the Northeast before moving off the north Atlantic Coast. Relatively dry conditions prevailed across most of the country by Thursday with the exception of heavy snow squalls in northeastern Ohio and western New York. By week's end, a warming trend had commenced across the Great Plains and Midwest. Highs soared to 25°F above normal across portions of Kansas and Nebraska. Farther west, portions of the Pacific Northwest observed record highs on Friday with readings in the sixties, but a cold front moved inland, bringing lower temperatures and rain to the northern half of the Pacific Coast on Saturday.

According to the River Forecast Centers, the greatest weekly totals (more than 2 inches) fell along the eastern half of the Gulf and the southern Atlantic Coasts [Table 1]. Between 4 and 9.4 inches were reported at several locations from central Louisiana through southern Georgia [Figure 1]. This week marked the fourth consecutive week of ample rainfall along the central and eastern Gulf Coast and parts of the southern Atlantic Coast. Generous rains have also soaked much of the western Gulf Coast since mid–December, although the region was relatively dry the past two weeks. Elsewhere, scattered heavy amounts (2–4 inches) were observed at a few locations in central and southern Indiana, the Cascades, and extreme southeastern Alaska. Light to moderate amounts fell along the northern two–thirds of the Pacific Coast, on portions of the northern and central Rockies, the southern Great Plains, and across most of the eastern half of the country. Little or no precipitation was observed throughout the Intermountain West, along the southern third of the Pacific Coast, the north–central and southern Rockies, most of the northern and central Plains, sections of the lower and upper Mississippi Valleys, Hawaii, and parts of the mid–Atlantic and southern Florida.

Despite a glancing blow of frigid air early in the week, unseasonably warm conditions prevailed across the northern Rockies and northern Plains, with weekly departures between +9°F and +14°F [Table 2]. Highs in Montana were in the single digits Tuesday, but had risen into the fifties by Saturday. Abnormally warm weather continued across the southern half of Florida and much of the eastern quarter of the country. Numerous record highs were established in southern Florida, where weekly departures up to +12°F were observed. Departures of +4°F to +8°F were common from northern Florida to northern New England and across the central Plains, where readings soared into the sixties late in the week. Farther north, a cooling trend occurred across much of Alaska, but several southeastern locations reported weekly departures between +5°F and +8°F.

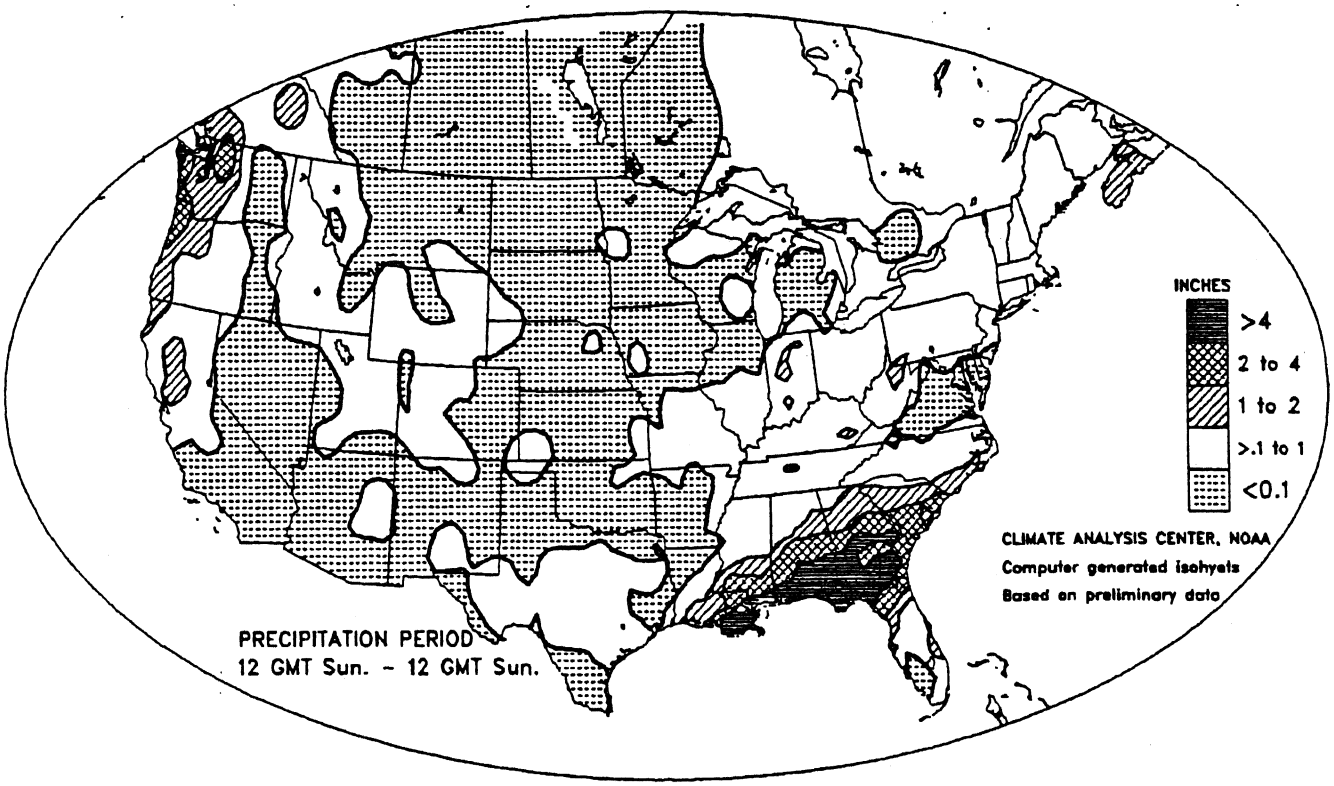
In sharp contrast, cold conditions affected the upper Midwest, central Rockies, Intermountain West, and most of the Pacific Coast states [Table 3]. Cold air trapped in the central Rockies and Great Basin valleys, along with ample snow cover, dropped temperatures below –20°F at some locations, producing weekly departures between –8°F and – 15°F. Highs remained in the single digits most of the week across the upper Midwest as cold Canadian air settled across the region early in the week, and departures reached –7°F across extreme northern portions. Farther north, bitterly cold air invaded most of the western half of Alaska as lows dipped to –50°F at Nenana, and weekly departures were as great as –12°F at Bettles.

TABLE 1. Selected stations with 3.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
VALPARAISO/EGLIN AFB, FL	8.78	MCCOMB, MS	5.29
PENSACOLA NAS, FL	8.16	TALLAHASSEE, FL	4.96
QUILLAYUTE, WA	7.38	VALDOSTA, GA	4.96
PENSACOLA, FL	7.22	MILTON/WHITING NAS, FL	4.89
VALDOSTA/MOODY AFB, GA	6.59	MOBILE, AL	4.52
MACON/ROBINS AFB, GA	6.08	WAYCROSS, GA	4.23
MACON, GA	5.76	DOTHAN, AL	4.03
NEW ORLEANS/LAKE FRONT, LA	5.62	ANNETTE ISLAND, AK	4.01
APALACHICOLA, FL	5.56	BILOXI/KEESLER AFB, MS	3.98
OZARK/CAIRNS AFB, AL	5.54	ALBANY, GA	3.46
PANAMA CITY/TYNDALL AFB, FL	5.46	COLUMBUS, GA	3.02
NEW ORLEANS NAS, LA	5.38	COLUMBUS/FT. BENNING, GA	3.01
NEW ORLEANS/MOISANT, LA	5.35		

OBSERVED PRECIPITATION

January 27 – February 2, 1991



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

January 27 – February 2, 1991

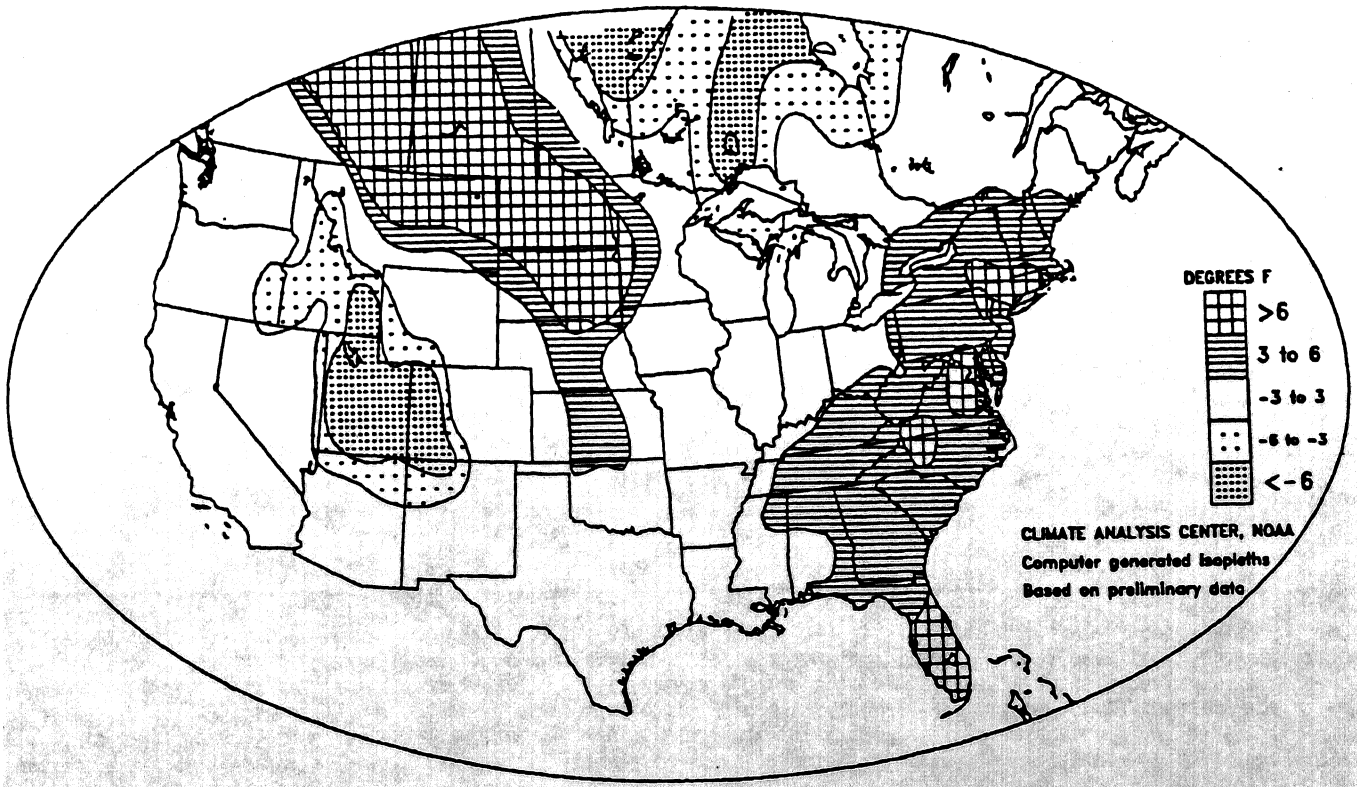


TABLE 2. Selected stations with temperatures averaging 8.0°F or more ABOVE normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
HAVRE, MT	+13.7	27.9	WATERTOWN, SD	+9.2	18.5
HURON, SD	+12.2	24.8	DEVIL'S LAKE, ND	+9.2	12.7
ABERDEEN, SD	+11.9	21.2	KEY WEST, FL	+8.8	78.6
FORT MYERS, FL	+11.5	74.7	TAMPA, FL	+8.8	68.5
VERO BEACH, FL	+11.3	73.0	DAYTONA BEACH, FL	+8.8	66.6
MELBOURNE, FL	+10.8	72.1	BISMARCK, ND	+8.5	16.7
FT LAUDERDALE, FL	+10.1	76.1	ROANOKE, VA	+8.3	43.7
PIERRE, SD	+10.1	26.4	WASHINGTON/DULLES, VA	+8.3	38.1
JAMESTOWN, ND	+10.1	16.7	DICKINSON, ND	+8.3	20.5
CUT BANK, MT	+9.9	37.4	UTICA, NY	+8.1	27.7
MINOT, ND	+9.9	17.4	ANIAK, AK	+8.1	10.4
WEST PALM BEACH, FL	+9.5	74.6	WASHINGTON/NATIONAL, DC	+8.0	43.3
MIAMI, FL	+9.2	76.3	NEW YORK/LA GUARDIA, NY	+8.0	39.6
ORLANDO, FL	+9.2	69.1	SIOUX FALLS, SD	+8.0	21.6
GLASGOW, MT	+9.2	18.7			

TABLE 3. Selected stations with temperatures averaging 6.0°F or more BELOW normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
GRAND JUNCTION, CO	-15.3	12.7	ESCANABA, MI	-7.0	8.4
DELTA, UT	-14.6	13.1	ALAMOSA, CO	-7.0	10.6
BETTLES, AK	-11.7	-20.7	HOMER, AK	-6.3	16.2
IDAHO FALLS, ID	-10.8	9.3	SALT LAKE CITY, UT	-6.3	24.1
POCATELLO, ID	-8.8	16.7	FARMINGTON, NM	-6.3	25.2
PRICE, UT	-8.5	16.0	GULKANA, AK	-6.1	-10.5
KODIAK, AK	-7.9	22.5	ILIAMNA, AK	-6.0	9.9
NOME, AK	-7.6	-2.4	EAGLE, CO	-6.0	14.2
KING SALMON, AK	-7.4	6.3	CEDAR CITY, UT	-6.0	25.2

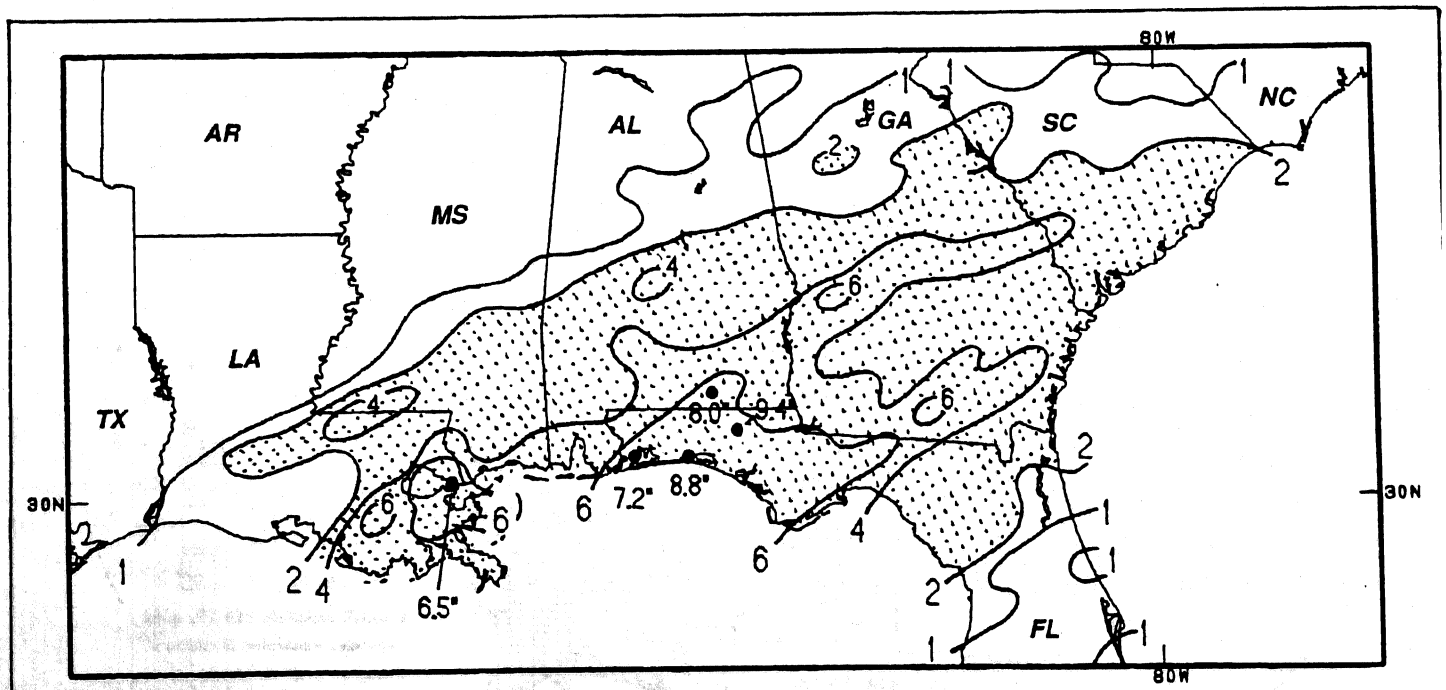
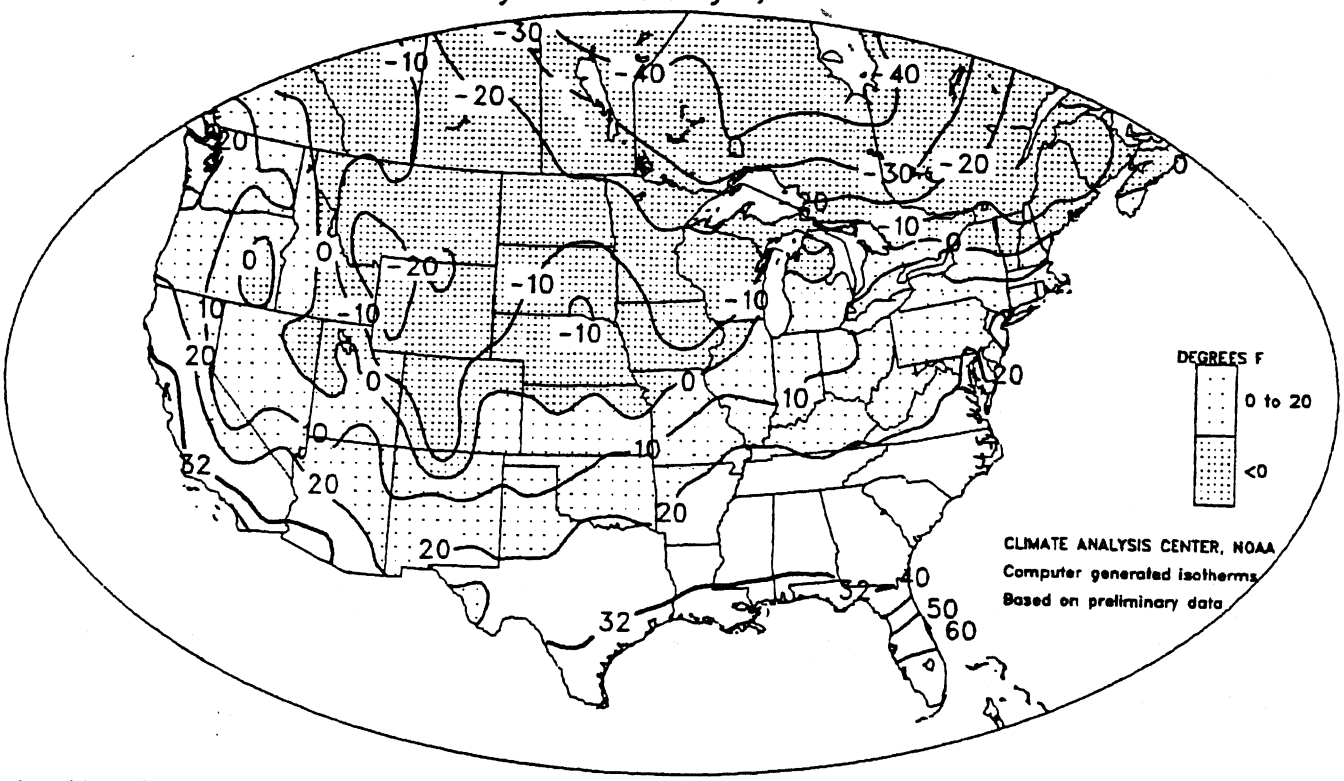


Figure 1. *Total precipitation (inches) during the week of January 27 - February 2, 1991 based upon first-order synoptic, airways, and the River Forecast Centers stations. Isohyets are only drawn for 1, 2, 4, and 6 inches, and stippled areas are more than 2 inches. For the* ***fourth consecutive week****, heavy rains (up to 9.4 inches) soaked much of the eastern Gulf and southern Atlantic Coasts, producing some flooding in the region. Since the start of January, many locations measured over a foot of rain, and a few stations approached two feet. It was only last year that much of this area experienced abnormal dryness, especially during the spring, summer, and early autumn months.*

EXTREME MINIMUM TEMPERATURE (°F)

January 27 – February 2, 1991



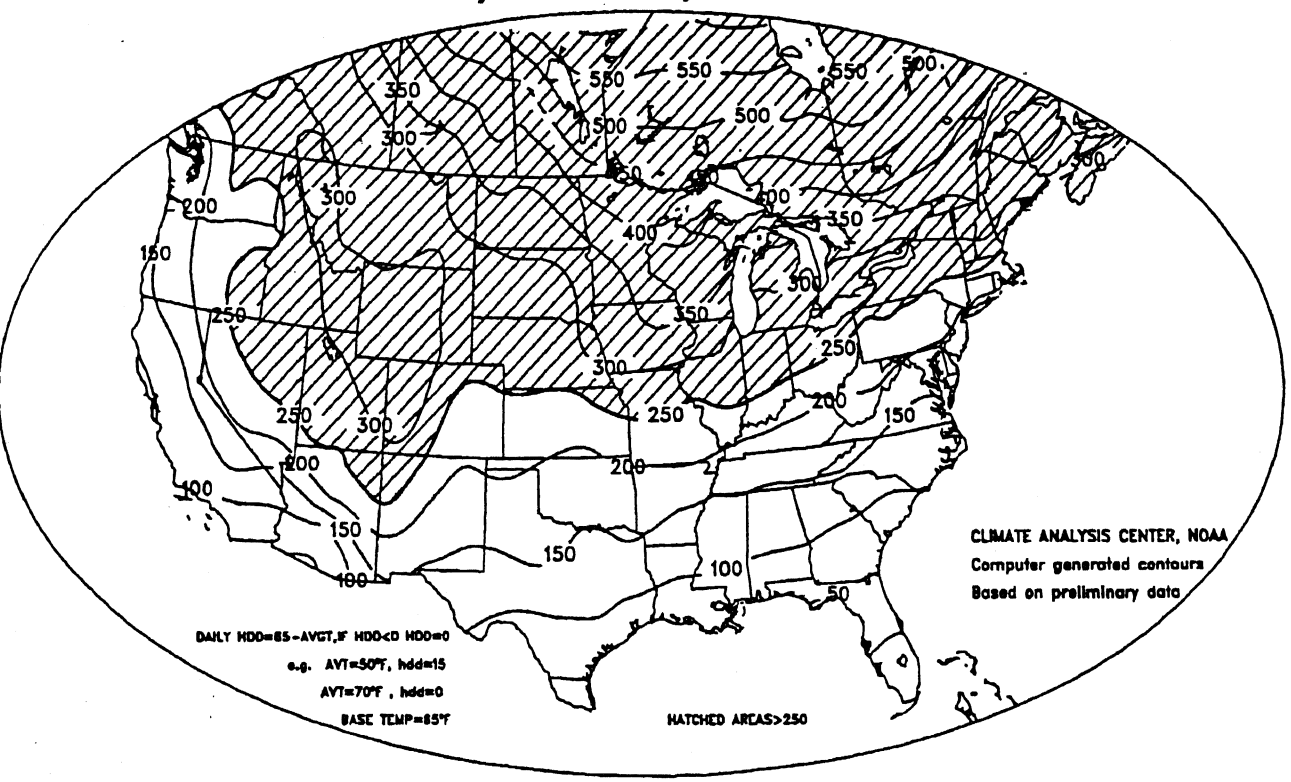
Bitterly cold Arctic air covered much of the contiguous U.S. early in the week as readings dropped well below 0°F across the north–central states and sub–freezing temperatures plunged southward to the Gulf Coast (top). Gusty winds and low temperatures produced dangerous (<–20°F) wind chills from the northern and central rockies eastward to the central Great Lakes region, and in northern New England (bottom).

MINIMUM WIND CHILL (°F)

January 27 – February 2, 1991

WEEKLY TOTAL HEATING DEGREE DAYS

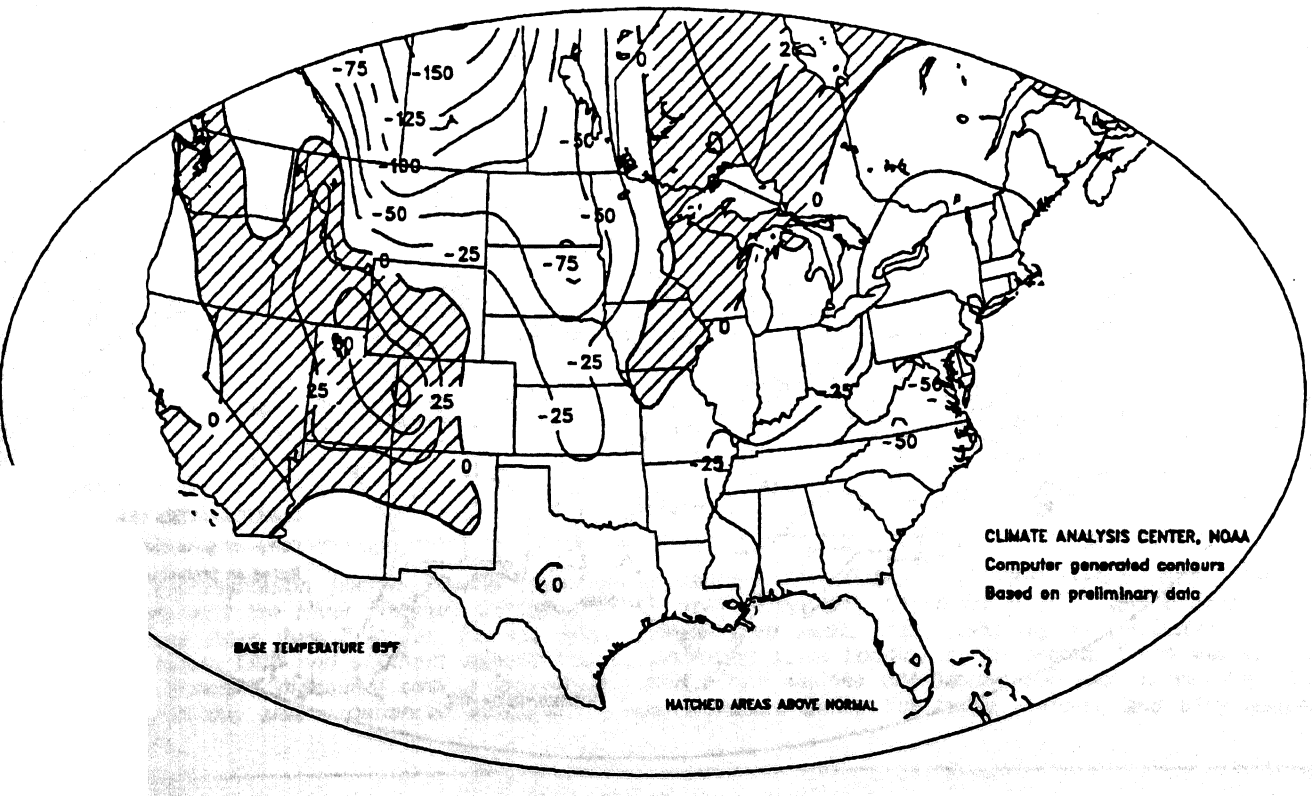
January 27 – February 2, 1991



kly heating usage was generally near seasonal levels across the lower 48 states as the greatest heating (>300 HDD's), as expected, found in the northern half of the Rockies, northern Great Plains, upper Midwest, and northern New England (top). Significant above nal weekly heating demand (+50 HDD's) was limited to the central Rockies while substantial subnormal heating requirements (–50 D's) were found in the upper and middle Missouri Valley and parts of the mid–Atlantic (bottom).

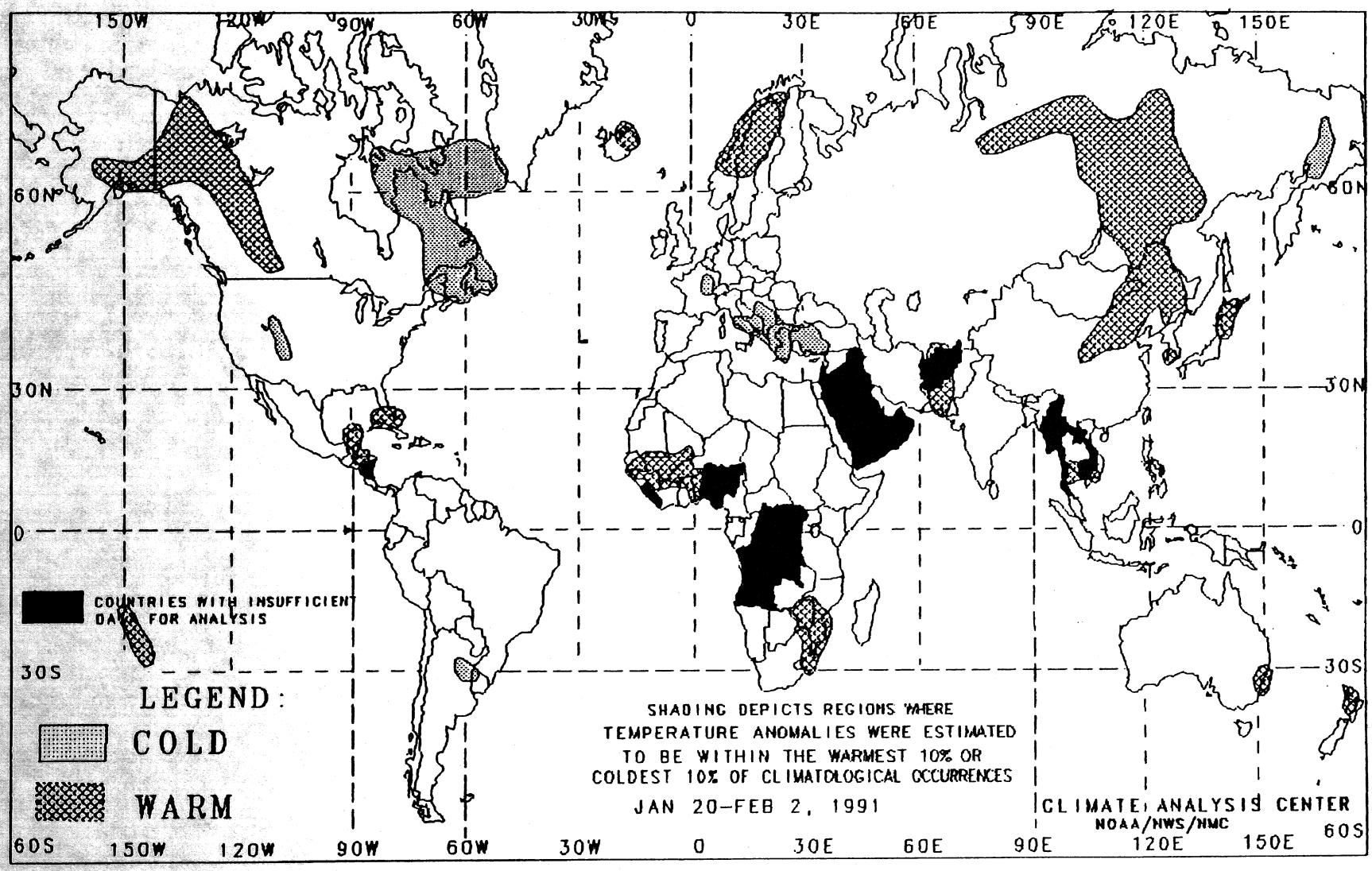
WEEKLY DEPARTURE FROM NORMAL HDD

January 27 – February 2, 1991



GLOBAL TEMPERATURE ANOMALIES

2 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty–four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

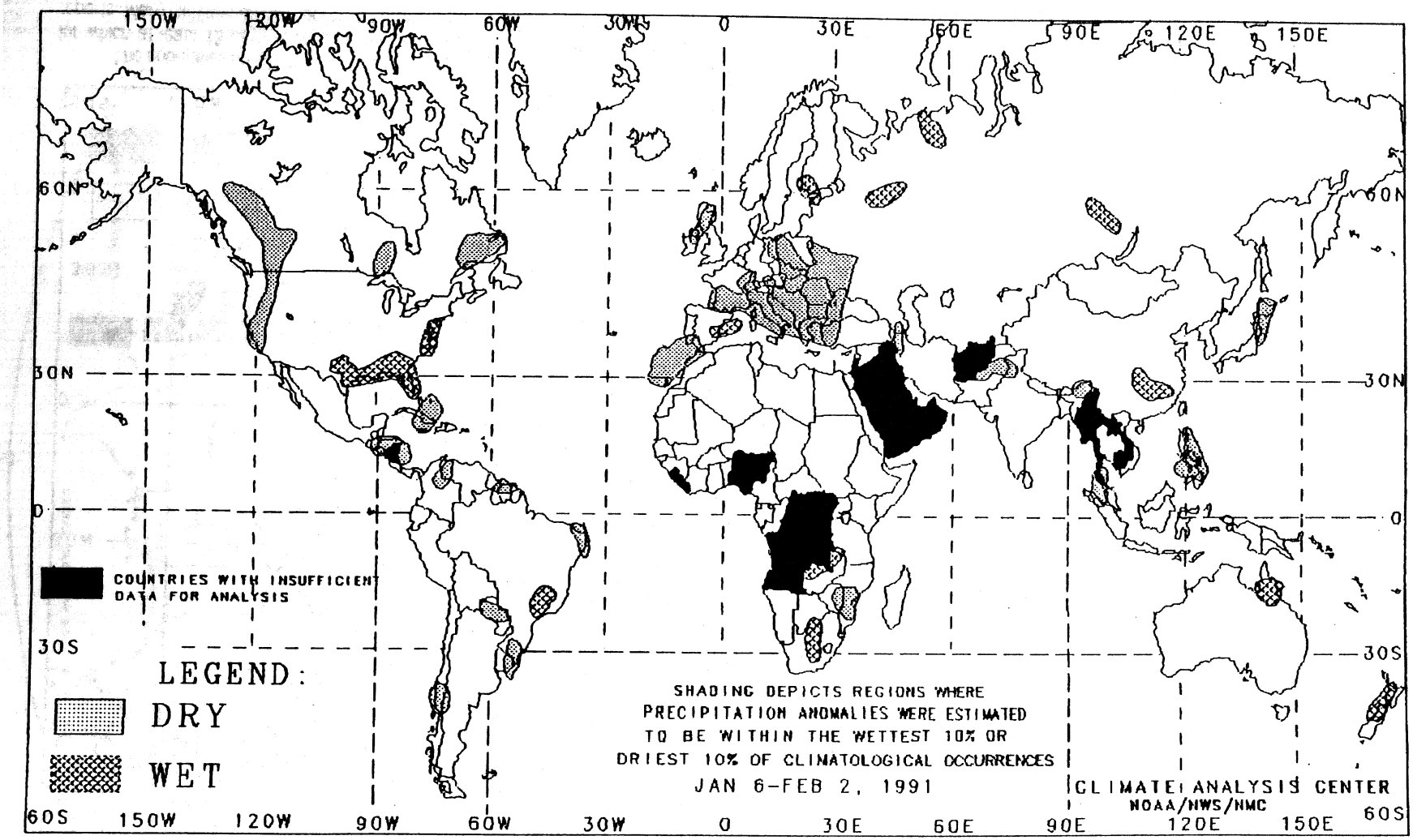
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

SPECIAL CLIMATE SUMMARY

WESTERN REGIONAL CLIMATE CENTER, RENO, NV

Information Compiled From:

SOIL CONSERVATION SERVICE, NEWS SOURCES, AND STATE OFFICIALS

and

ANALYSIS AND INFORMATION BRANCH
CLIMATE ANALYSIS CENTER, NMC
NATIONAL WEATHER SERVICE, NOAA

UPDATE ON RECENT WESTERN CLIMATE CONDITIONS

The major weather and climate events during the past two months in the West have been the December Arctic air outbreak and the continuing long–term drought, with California especially hard hit by both.

About a week before Christmas, cold air slipped over the Canadian border from Washington to Montana and continued towards the most southerly portions of the West. Temperatures fell to –50°F at Worland, WY and –50°F and lower on three days at Wisdom, MT. The Utah state climatologist reported that an automated site in a high mountain valley recorded –57°F. A site near Logan, UT fell to –44°F, tying the all–time low for the region (Cache Valley). Big Sky ski resort in Montana dropped to –40°F on four successive days, bottoming out at –46°F. Many stations in Montana did not rise above –20°F during daylight. The Nevada state climatologist noted that 16 stations with at least 30–year records fell to all–time low. Three stations with century–long records exceeded previous all–time mi ums by exactly one degree. A new Nevada record for December w set at Mountain City, which plunged to –46°F. Reno dipped to –13°F, bu utlying areas fell to –34°F. Reno reported approximately three millior llars damage from broken pipes. Six feet of water covered the orchestr it and 300 seats at the city's concert hall and forced the cancellation events for six weeks. Natural gas reserves fell to low levels, and some in tries were forced to slow down or stop for lack of heating gas. Throug mid–December, Hanford, WA was well on its way to the warmest ye n record; however, after the cold wave, 1990 ended up as only the fift warmest year there. Several locations in Oregon observed all–time rec minimums, with single–digits along the coast and sub–zero temperature the Medford area. Temperatures were as much as 40–50°F below norm California experienced its worst freeze in 41 years. The unharvested % of the navel orange crop was lost. Temperatures reached sub–freezin evels on 12–13 consecutive days in the Central Valley. Orchard tre rvival (mortality occurs below about 22°F) was in doubt in many locati [see front cover of Weekly Climate Bulletin #90/52 for extreme mi ums in the Southwest during Dec. 20–29, 1990]. Losses

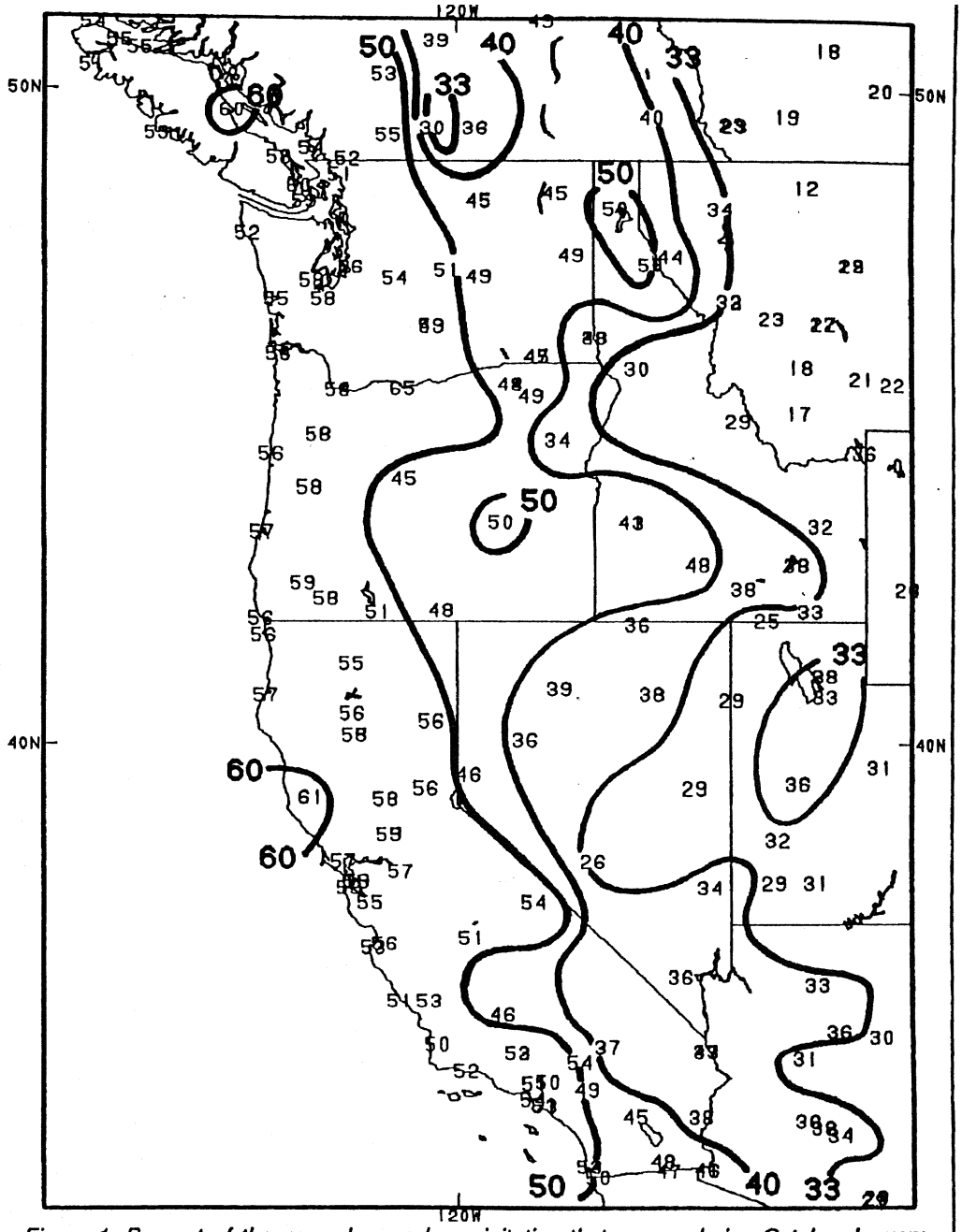


Figure 1. Percent of the normal annual precipitation that occurs during October-January [4 months] in the Far West. Isopleths are drawn for 33, 40, 50, and 60%. If the precipitation was equally-distributed per month, any 4-month period would typically receive 33% [4/12] of the normal yearly precipitation. Most of the Pacific Coast states, however, observe a precipitation maximum during the late autumn-winter months (and into the early spring months-see Figure 3) as over half the usual annual precipitation occurs during this period. Unfortunately, these 4 months were extremely dry (with the exception of western Washington).

were estimated at $300– 500 million, but each direct dollar in the $17.5 billion state agricultural economy generates another $3 in indirect benefits. As a result, the total loss to the state is estimated to be near $1 billion.

The strongest surge of the Arctic air mass finally retreated eastward during the end of December and early January, but cold air trapped in various valleys of the West produced ice fog, causing airport delays and a number of fatal highway accidents.

Precipitation and snowpack have been skimpy this Winter over much of the West. The Palmer Hydrological Drought Index indicated that most of the West, with the exception of New Mexico, the eastern two–thirds of Arizona, and the far northern Puget Sound, was in a state of moderate to extreme drought. As of Feb. 4, Soil Conservation Service (SCS) remote stations depicted that snowpack water content is above average in just 11 of 71 Western river basins. The driest basins in the West which report to this system are the Carson–Walker (15%) and the Truckee–Tahoe (17%). The greatest snowpack deficits is at Squaw Valley, where the present water content of 7.3" is far below the 42.0" average for February 4 [Figures 9 and 10].

By contrast, the wettest basins in the West are the Sun, Teton, and Marias Rivers near Glacier Park at 152% of average snowpack. Lyman Lake in the Washington Cascades reported 69 inches of water in its snow, or 150% of average. Since October 1, 1990, 107.6 inches of precipitation have fallen on Ollalie Meadows (161% of average) in Washington, and 105.7 inches was measured near Mt. Saint Helens (109% of average).

Lake Tahoe dropped to its lowest point in recorded history on January 15, at 14.9 inches below the rim. The lake continued to fall at a time when it is normally remaining constant or rising, and is now nearly 16 inches below the rim. The meager snowmelt was forecast to raise the lake only 8 or 9 inches this Spring, so the Truckee River may not flow at all from the lake this Summer. This forecast was made before the exceptionally dry January which brought only about 3% of average January precipitation to California. Some locations around Lake Tahoe received nothing! Water restrictions will be imposed in Reno this Spring as a consequence. It is estimated that about 12 FEET of snow is needed to raise the lake to its rim this Summer.

One ski area at Lake Tahoe has declared bankruptcy, and another opened for just 4 days and then closed. Ski areas without expensive snowmaking equipment have only a foot or so of snow on the ground. Employment at the 16 ski areas in the basin is near 3500 compared to an average of 7000. Squaw Valley has only about a quarter of its usual 900–person work force. December unemployment claims in the area were 38% above the levels of a year ago (which was also very dry).

Only 4 of the past 20 winter months (October–May) in the Sacramento River basin have been wetter than normal. All four months so far this Winter have been very dry. There is less than a 5% chance that enough precipitation will fall to have average runoff, and there is almost one chance in ten that runoff in the Sacramento basin will be less than the

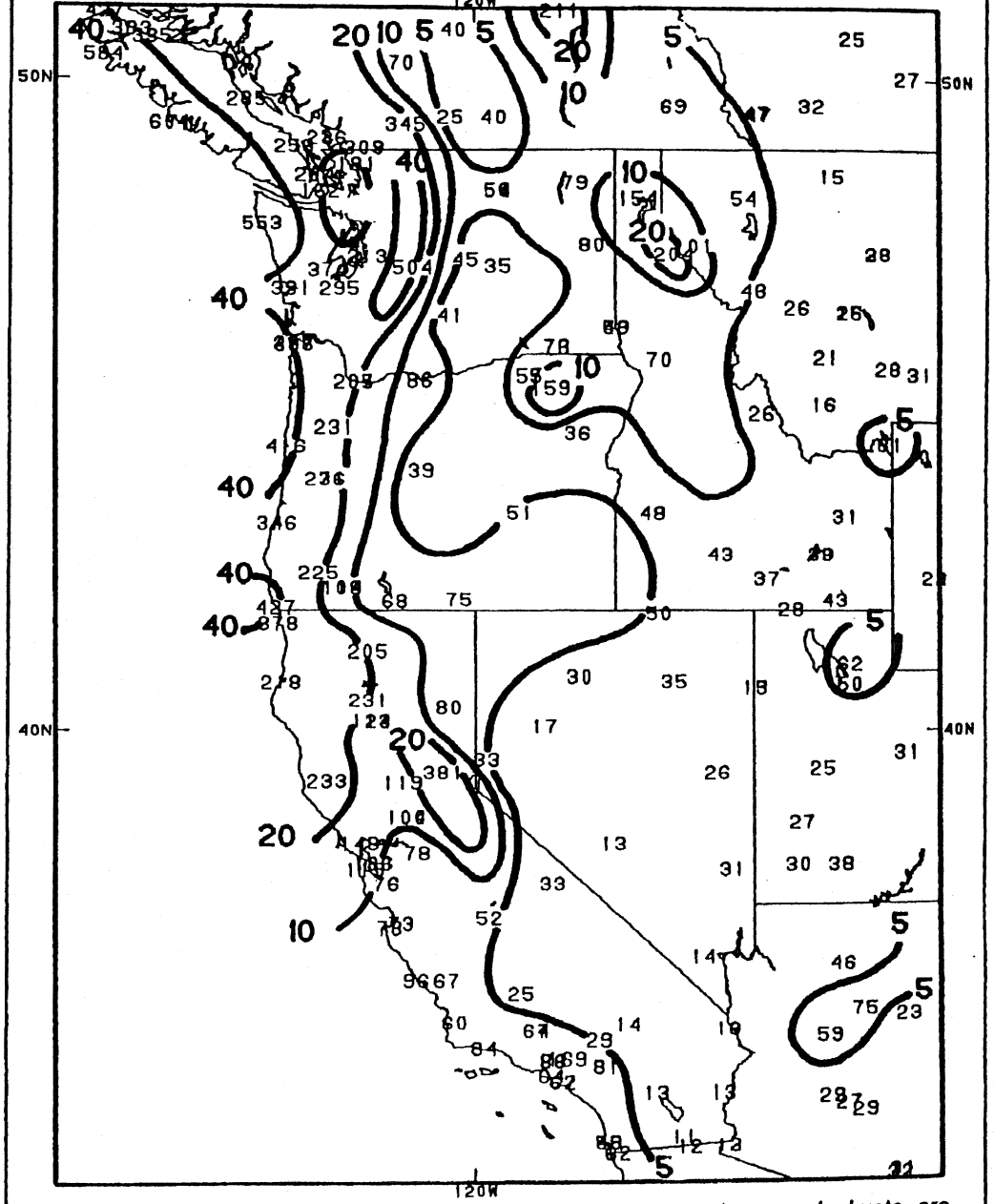


Figure 2. Total normal precipitation (inches) during October-January. Isohyets are drawn only for 5, 10, 20, and 40 inches, and stations values are in tenths of inches [e.g. 346=34.6 inches]. Late fall and early winter precipitation typically increases from south to north and from east to west, with over 40 inches along the Pacific Northwest Coast and in the northern Cascades to under 5 inches in the Great Basin and desert Southwest. The 5-10 inches of precipitation along coastal southern California, however, represents over half their normal annual total.

all–time low recorded in 1977. Through January 25, the benchmark station at Blue Canyon had received just 6.14" since last July 1, only 16% of the average for that interval of 37.39" and 9% of its average annual total of 67.87".

On a long–term basis (since the start of the 1986–1987 rainy season), large precipitation deficiencies have accumulated across the region (front cover, Figure 8). Depending upon the location, 51 month (4 1/4 year) deficits vary from 164 mm [6.5 inches] at Bakersfield, CA (73.7% of normal) to 1151 mm [45.3 inches] at Eureka, CA (74.1% of normal). Less than 60% of the normal precipitation fell at San Francisco, Los Angeles, and Santa Maria, CA since Oct. 1, 1986, producing deficits of more than 575 mm [22.6 inches].

Over California as a whole, more than half of the usual precipitation season has passed [Figures 1 and 2], with roughly one–third to one–quarter of the average precipitation [Figures 5, 6, and 8]. A significant portion of the normal annual precipitation (approximately 25–35%) typically occurs during February and March [Figures 3 and 4], and heavy precipitation may occasionally fall during April and early May before the normally dry and warm summer months. Prospects for significant relief, however, are very bleak, and drastic cuts to agricultural users (65–85% reductions) are being discussed. Freeze–stressed orchards may be subject to a double–whammy with less water.

Runoff in California has averaged near two–thirds of normal for each of the last four winters, and this fifth year of drought has so far been even drier. Reservoirs have fallen throughout the state, and continue to fall at a time when they are normally filling. Storage in 155 major reservoirs was 54% of average at the start of January, and had fallen to about half of average at the end of the month. Reservoirs in the Los Angeles area are storing about one–third of the average water, and Hetch Hetchy Reservoir, source of San Francisco's water, is only 12% full, containing 27% of the average water content for this time of year. Several major reservoirs contain less than 10% of average water, and only one exceeds 100%.

Los Angeles is planning mandatory rationing beginning in February. Water for growers will be reduced by 30%, and for residential and industrial users by 10%. A poll by the Los Angeles Times showed that drought is considered the most important issue to 36% of the people there, second to crime/drugs/safety (43%). Limits of 300 gallons per week have been suggested for the San Francisco area, provoking animated debates. A general statewide decision is scheduled for Feb. 7, and preliminary decisions pertaining to allocation of water by the mammoth Central Valley project will be made in mid–February. California uses about 35 million acre–feet (maf) in an average year. This year's supply will be about 25.5 maf (with normal weather for the remainder of the year), and could be as low as 22 maf if dryness continues. A crucial question is how much of the reserves to use this year, and how much to save for a possible sixth year of drought.

Some interesting events have occurred with the reservoirs dropping to extremely low levels: old townsites, bridges, and other structures have

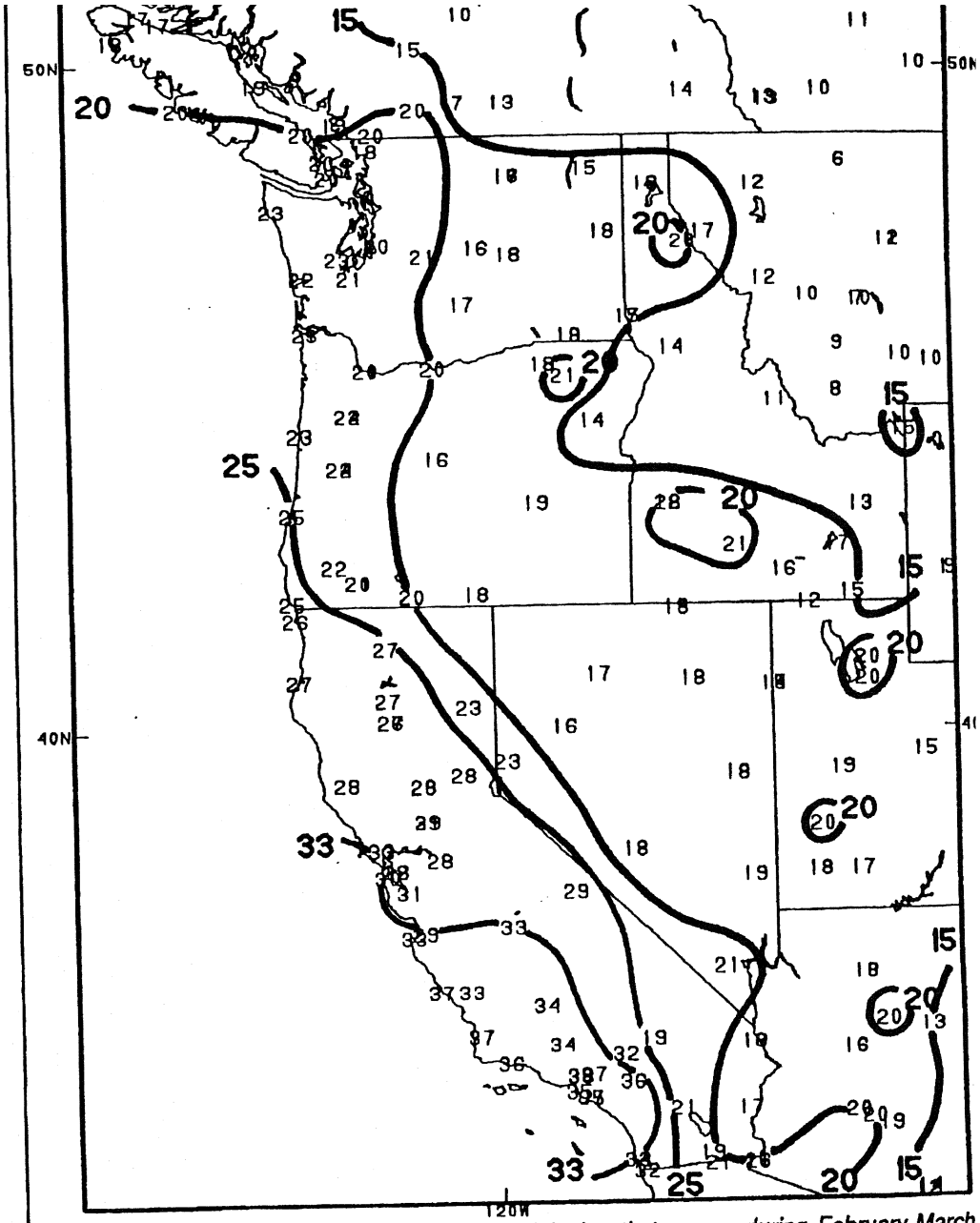


Figure 3. Percent of the normal annual precipitation that occurs during February-March [2 months] in the Far West. Isopleths are drawn for 15, 20, 25, and 33%. If the precipitation was equally-distributed per month, any 2-month period would typically receive 16.7% [2/12] of the normal yearly precipitation. Similar to Figure 1, the Pacific Coasts states, especially southern California, observe a significant amount (>25%) of their usual annual precipitation during the late winter and early spring months. So, even though over half of their 1990-1991 rainy season [Oct.-Jan.] is over, substantial precipitation can still fall during February-March (and occasionally in April and May).

been uncovered, reviving old memories. In some cases, excellent whitewater has re–emerged for rafters and kayakers in streams with sufficient flow. A plane that had been missing since 1963 became visible on the bottom of Calaveras Reservoir near San Jose, finally resolving the 27–year mystery for the victims' relatives.

December's cold snap aggravated southern California's fire danger by killing brush already sapped of moisture by years of drought, turning it into highly flammable fuel. The frost killed about 10% of the region's wild vegetation, 10 times the normal 1% annual die–off produced by drought according to Los Angeles County Fire Department's vegetation management officer. Pine, cypress, and eucalyptus trees were especially vulnerable to the frost, along with common landscaping plants like juniper and ivy. The region's fire season usually eases during the normally wet and cool winter months, but extremely dry weather during this Fall and Winter, combined with four consecutive subnormal rainy seasons and the frost kill, have raised concerns about an early and possibly prolonged fire season. These concerns recently grew as rare January wild fires blackened 116 acres in the northern Sierras on Jan. 22, and 180 acres of brush and timber were charred on Jan. 31 in the Mendocino National Forest.

In other parts of the West, above normal precipitation has increased reservoir storage over last year in New Mexico and Arizona. The ski area at Taos, NM is having an excellent year. The Bureau of Reclamation reported that storage in Colorado is 111% of average, 13% above last year. Once again, the driest area is the Upper Colorado River. Inflow to Lake Powell is expected to be about 70% of average this Summer. Lake Powell has dropped considerably over the past two years, containing 83% of capacity last year and 62% this year. The Bureau of Reclamation reported that on Jan. 1, large reservoirs on the lower Colorado contained 78% of combined capacity. Washington has mostly good storage as a result of heavy early Winter rains. Unfortunately, the copious November rains caused extensive flooding and widespread damage to western sections of the state [see Weekly Climate Bulletin #90/47]. Oregon reservoirs are low, especially in the east, and streamflow is projected to be well below normal. Nevada reservoirs are exceptionally low. Storage is near to below normal in Idaho, Wyoming, and Montana. Water shortages are foreseen this Summer even with normal precipitation in California, eastern and southern Oregon, and some basins in Montana and Idaho. For a summary of state reservoir storages in the West as of January 1, 1991, refer to Figure 7. The projected Spring and Summer streamflow forecast made on Jan. 1 from the Soil Conservation Service and the National Weather Service is for much below normal (<70%) flow in the Sierra Nevadas (eastern California), Great Basin (Nevada), eastern Oregon, central Idaho, most of Utah, and northwestern Colorado [not shown]. Above (110–130%) and much above (>130%) normal flow was forecast for northern Washington, Idaho, and Montana, and northern New Mexico and extreme southern Colorado.

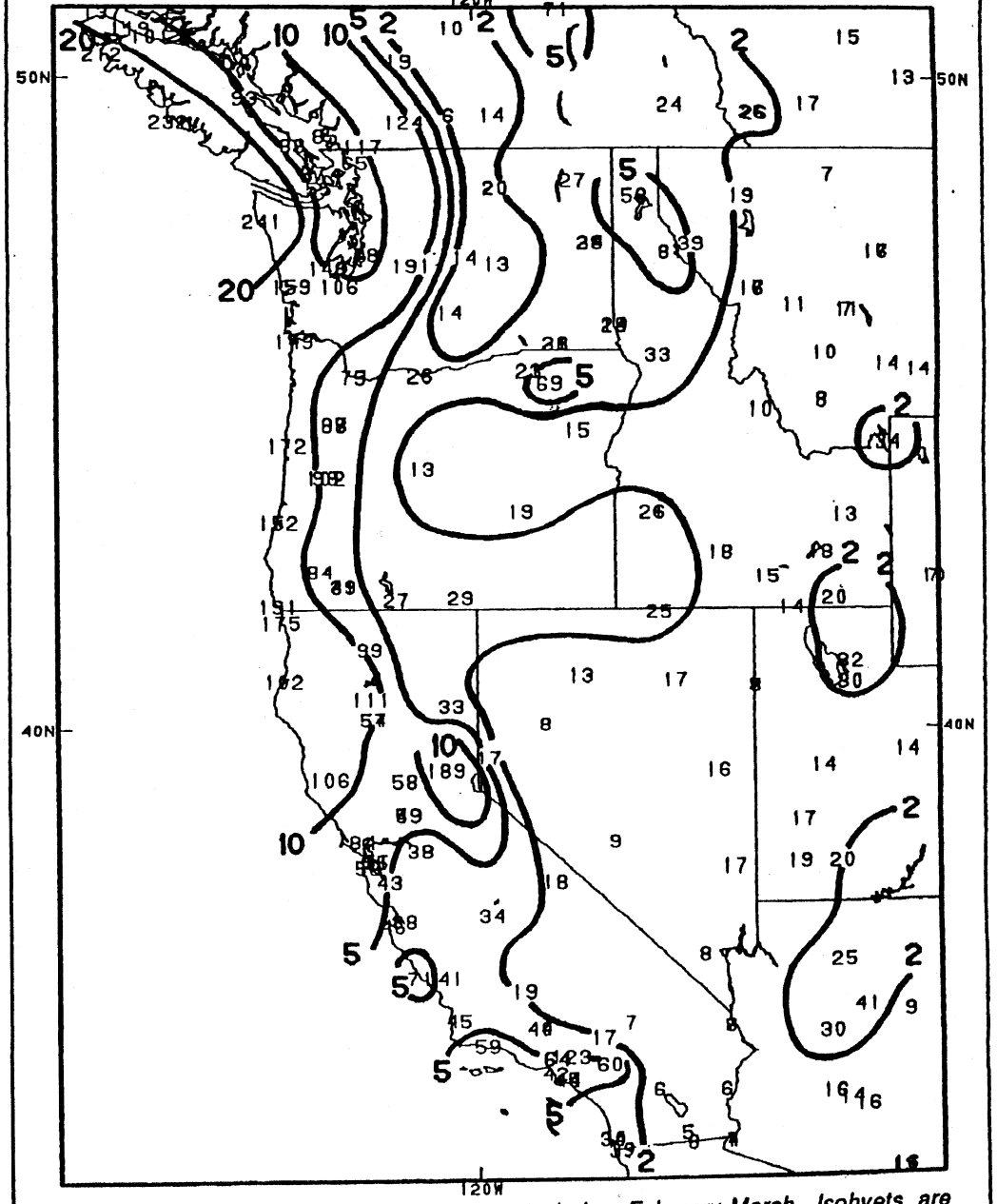


Figure 4. Total normal precipitation (inches) during February-March. Isohyets are drawn only for 2, 5, 10, and 20 inches, and station values are in tenths of inches [e.g. 17=1.7 inches]. Late winter and early spring precipitation typically increases from south to north and from east to west just as in Figure 2. February and March are still important to southern California as 3-6 inches represents over a third of the normal annual precipitation.

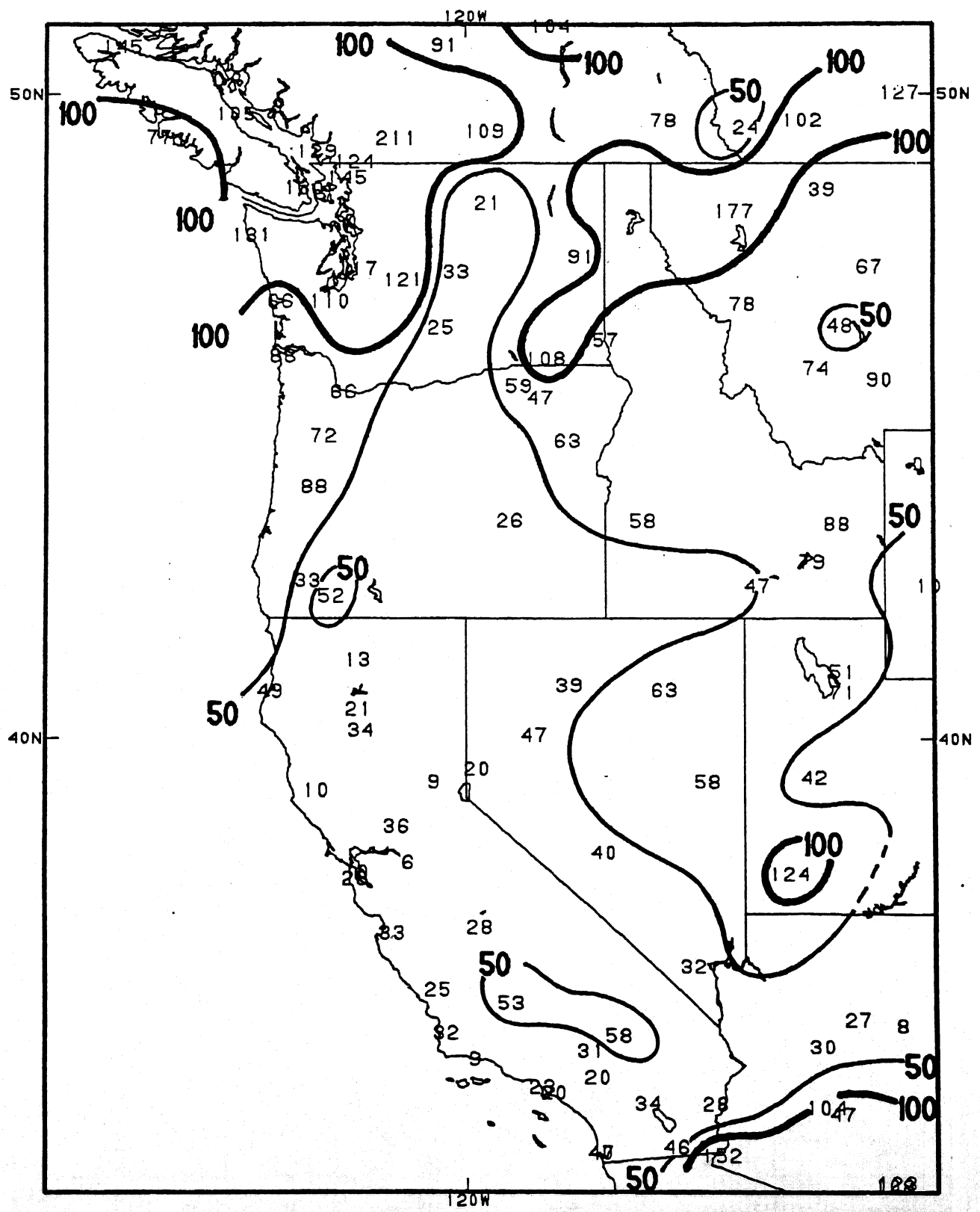
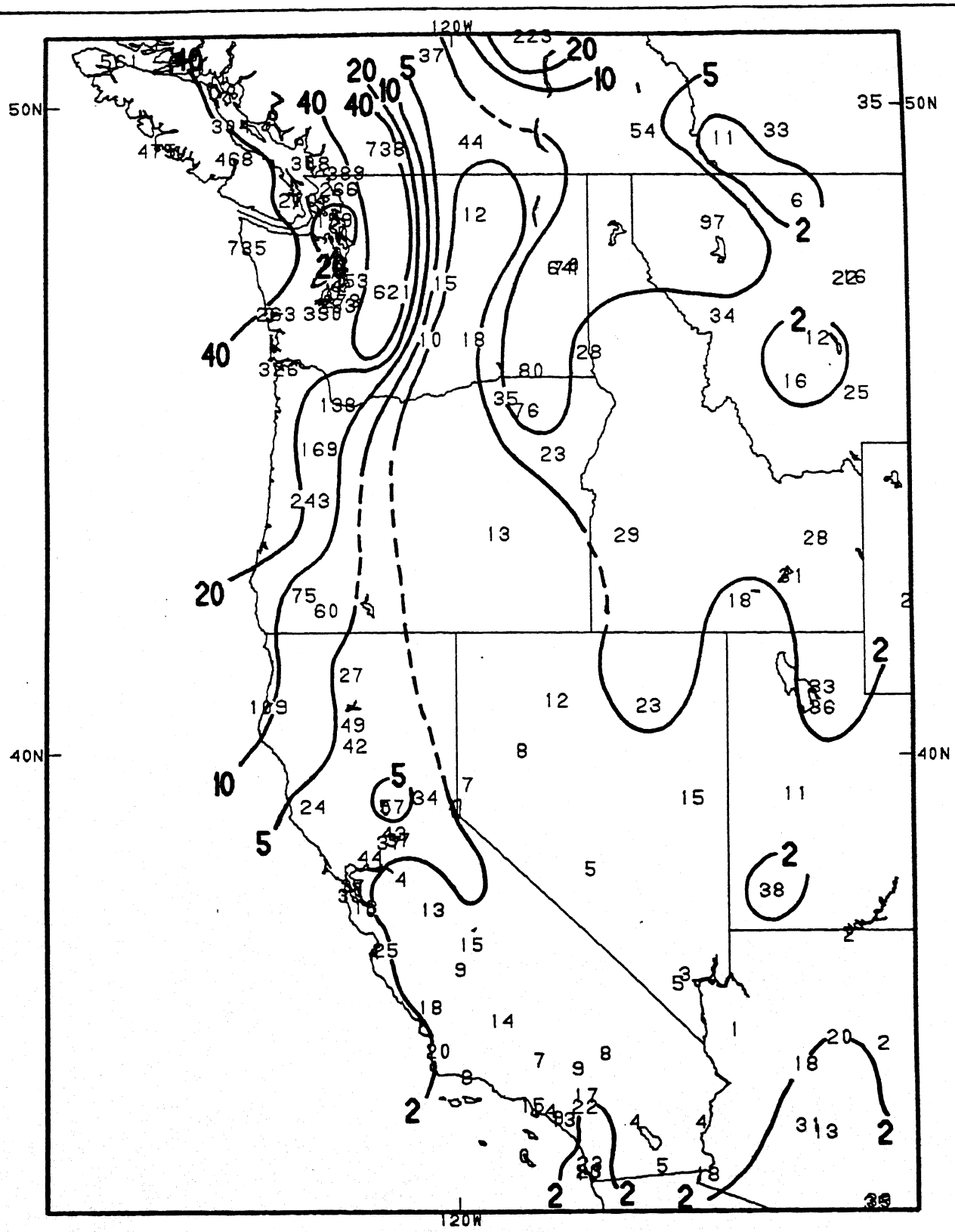


Figure 5. Percent of normal precipitation during October 1, 1990 - February 2, 1991. Isopleths are only drawn for 50 and 100%. With the exception of western Washington (thanks to copious November rains), northern Idaho, northwestern Montana, southwestern Utah, and southern Arizona, the remainder of the Far West has experienced extremely dry late autumn and early winter months, with generally less than half the normal precipitation throughout the Intermountain West and the southern half of the Pacific Coast states.



igure 6. Total precipitation (inches) during October 1, 1990 - February 2, 1991. Isohyets are only drawn or 2, 5, 10, 20, and 40 inches, and station values are in tenths of inches [e.g. 243=24.3 inches]. The reatest amounts (>40 inches), as expected, fell along the Pacific Northwest Coast and on the northern ascades, but the totals in the southern sections of the region (which are normally much less than the orthern areas) were exceptionally low, especially throughout California. Four-month amounts were generally nder 5 inches in the central part of the state and less than 2 inches in southern California.

State	Snow Water Content Percent of Average On Given Date		Precipitation Percent of Average Oct. 1,1990 – To Date Below	
	Feb 4	Dec 31	Feb 4	Dec 31
Arizona	97	150	85	97
California (Great Basin area only)	19	24	24	26
Colorado	75	82	94	96
Idaho	69	84	75	88
Montana	101	114	109	127
Nevada	41	44	44	47
New Mexico	107	159	118	149
Oregon	54	74	75	77
Utah	64	70	73	78
Washington	88	100	116	131
Wyoming	81	86	96	91
West Region (except rest of California)	72	84	85	93
River Basins				
Arkansas Basin (Headwaters)	76	95	106	118
Colorado Basin	70	75	84	87
Columbia Basin (USA Only)	74	91	89	100
Missouri Basin	88	95	99	102
Rio Grande Basin	106	130	117	135
The Great Basin	44	49	49	54

WESTERN REGIONAL CLIMATE CENTER
and the SOIL CONSERVATION SERVICE

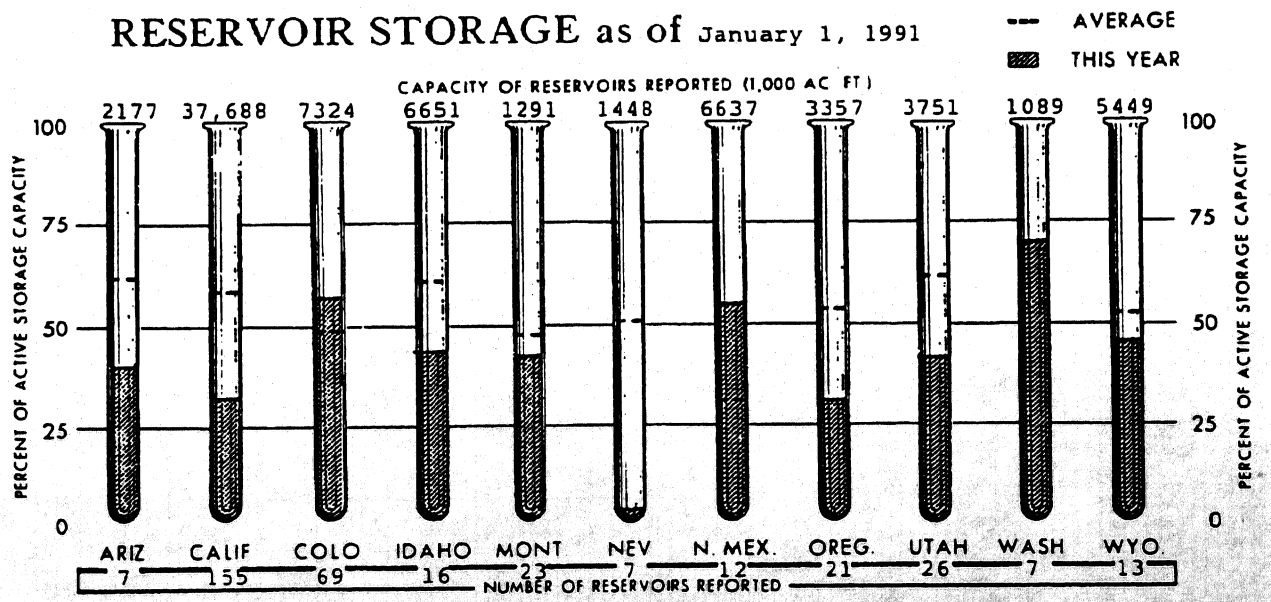
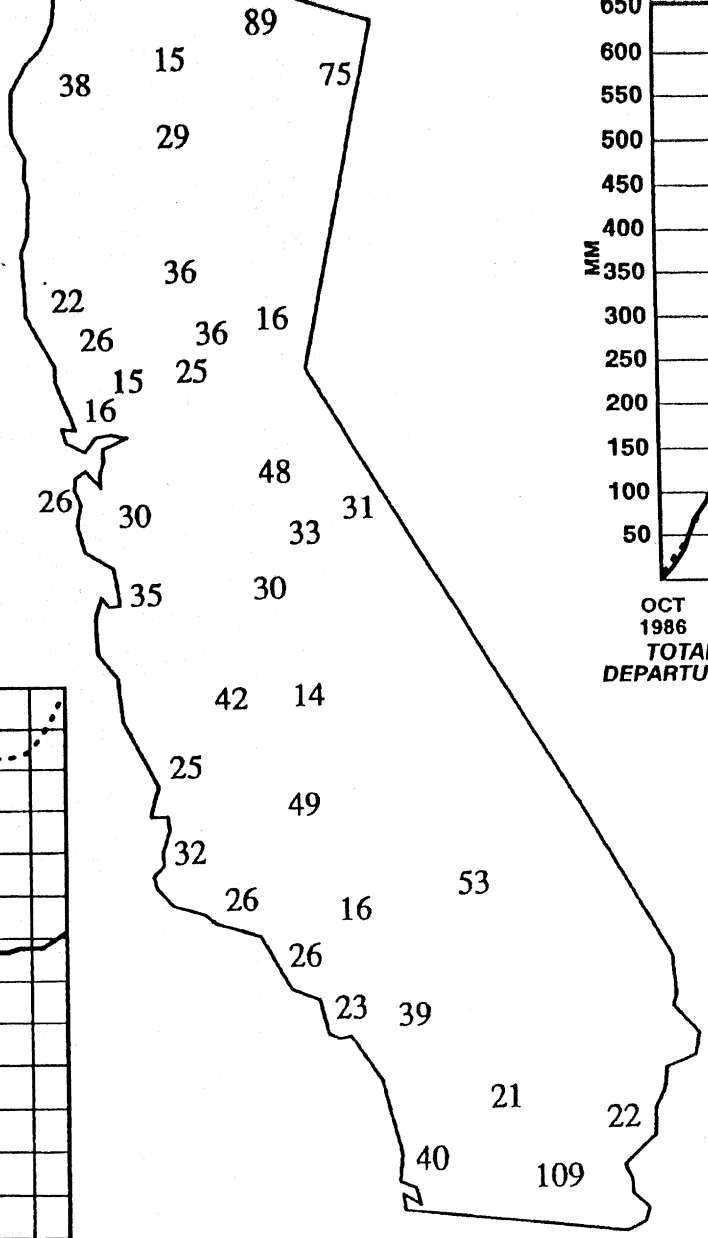
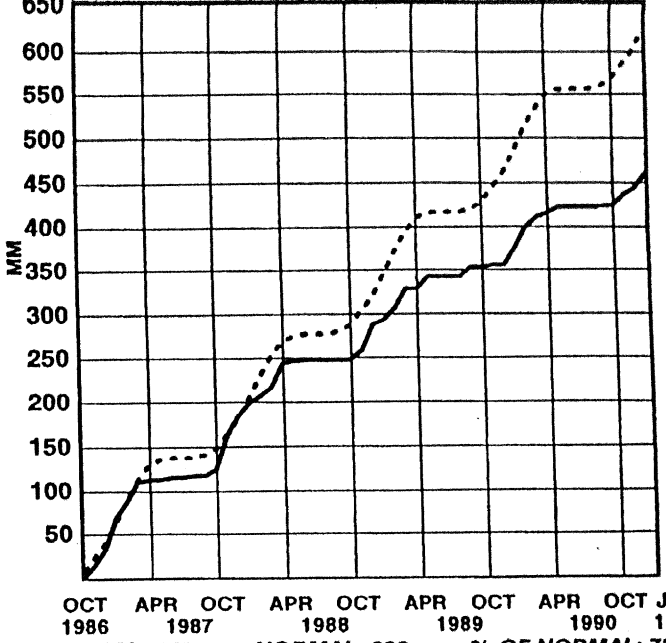


Figure 7. Western states reservoir storage as of January 1, 1991, obtained from the Water Supply Outlook for the Western United States, Jan. 1, 1991, page 13, and jointly produced by the Soil Conservation Service, USDA, and the National Weather Service, NOAA, Portland, OR. Reservoir storage capacity was extremely low in California, Nevada, and Oregon, but above normal in Washington, New Mexico, and Colorado. Unfortunately, recent snowpack and run-off projections are not favorable for the states with the lowest reservoir storage capacity.

California Precipitation Percent of Normal Since Jul. 1, 1990– Feb. 4, 1991

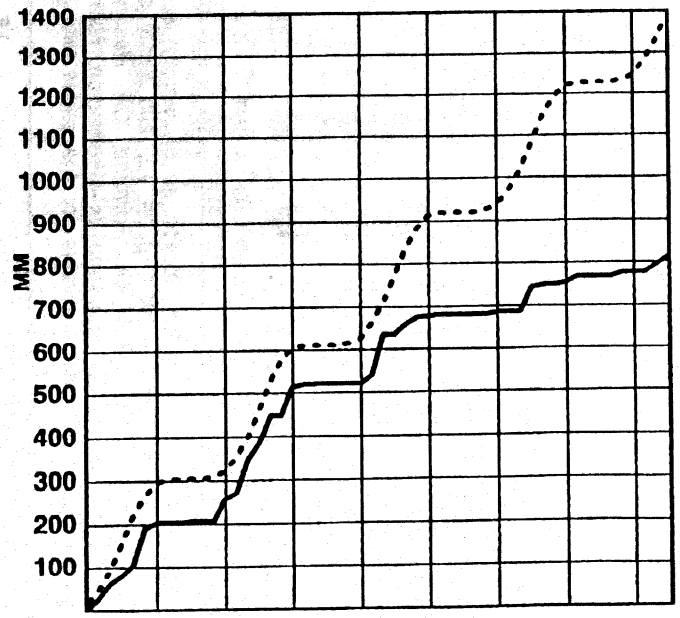
Data from California Agricultural Statistics Service and the Western Regional Climate Center





TOTAL: 459 mm NORMAL: 623 mm % OF NORMAL: 73.7
DEPARTURE FROM NORMAL: -164 mm (117% of Annual Normal)

SANTA MARIA, CA



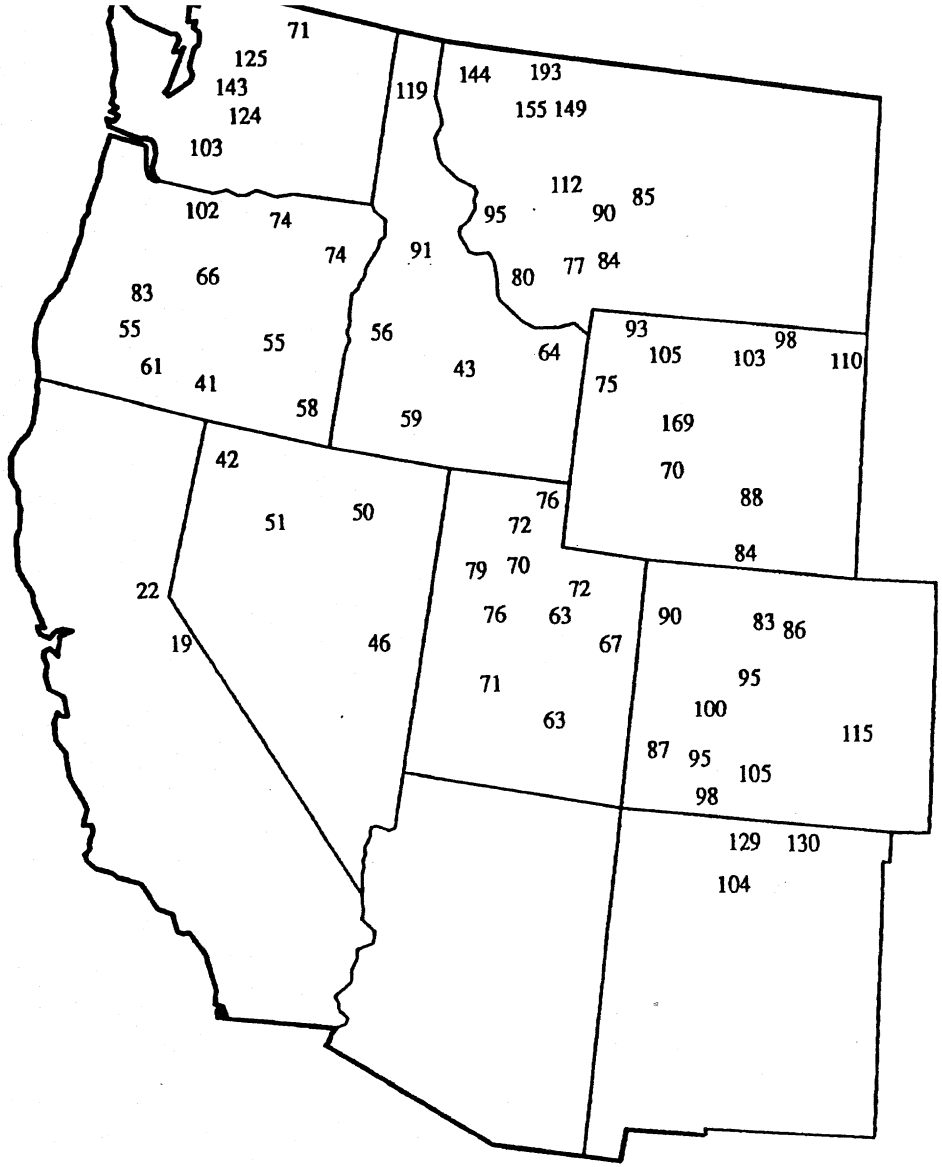
TOTAL: 809 mm NORMAL: 1385 mm % OF NORMAL: 58.4
DEPARTURE FROM NORMAL: -576 mm (187% of Annual Normal)

Figure 8. Selected California stations percent of normal precipitation during July 1, 1990 through February 4, 1991. Data obtained from the California Agricultural Statistics Service and the Western Regional Climate Center. Nearly every station in the state has measured subnormal precipitation since mid-Summer, and only 4 of these locations have recorded more than half the usual precipitation during the same time period. Unless extraordinarily heavy precipitation occurs during the late winter and early spring months, the 1990-1991 rainy season will become the fifth consecutive year with well below normal precipitation, further aggravating the current drought and wild fire situations.

Cumulative observed versus normal precipitation [Oct. 1986-Jan. 1991] for Bakersfield and Santa Maria, CA are depicted in the upper right and lower left corners, respectively, since the start of the current drought (additional locations on the front cover). 51-month deficits at both stations have exceeded a year's worth of normal precipitation at each location.

SNOTEL UPDATE

Precipitation Percent of Normal Oct. 1, 1990– Feb. 4, 1991 for the Western River Basins



Data from S Survey and the Western Re te Center

Figure 9. SNOTEL (SI update on the percent of normal precipitation during October 1, 1990 - February 4, 1991 for the Western river bas ected from 560 individual mountainous sites, then grouped and averaged into their respective river basin. The value 1 river basins. These figures were obtained from the Soil Conservation Service, USDA, and the Western Regional eno, NV. Similar to Figure 5, mountainous locations in the various river basins of the Far West have also meas ecipitation since October, particularly in the Sierra Nevadas, southern Cascades, and Great Basin region.

SNOTEL UPDATE

Snow Water Equivalent Percent of Normal Western River Basins Feb. 4, 1991

Data from SCS–Snow Survey and the Western Regional Climate Center

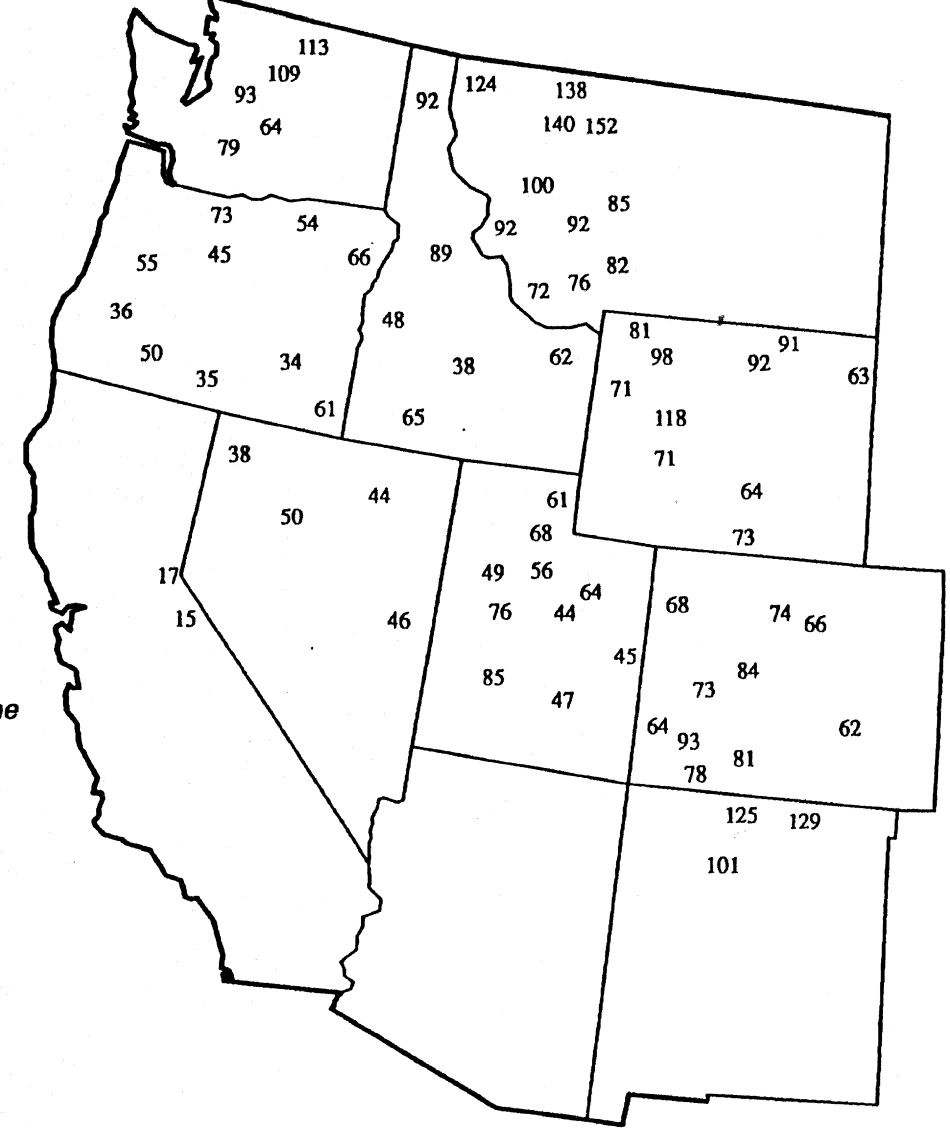


Figure 10. SNOTEL (SNOfall TELemetry) update on the percent of normal snow water equivalent during February 4, 1991 for the Western river basins. Data was collected from 560 individual mountainous sites, then grouped and averaged into their respective river basins. The values shown are for 71 river basins. These figures were obtained from the Soil Conservation Service, USDA, and the Western Regional Climate Center, Reno, NV. As expected, subnormal seasonal precipitation has produced well below normal snow water equivalent as of Feb. 4, especially in the southwestern and central sections of the region.